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Cactus Scrub



Arid Region



Scrubland Biome

Beating the Desert Heat

Clear blue skies oversee the low-growing, scrubby plants that cover the rocky soil of the cactus scrub. The clumps of small, golden-brown chollas, green prickly pears, red-green barrel cacti, and grayish-green agaves and yuccas here are punctuated by the occasional outstretched ocotillo and chubby, water-hoarding saguaro. Plants here reach their roots deep under ground to access buried water, or stash available water in their thick, succulent leaves; animals in this habitat include cold-blooded types that warm themselves on sun-baked rocks, and those that can go a lifetime without drinking water.



Where You'll Find It

Cactus scrub forms on rocky, sandy, and gravelly soils on south-facing slopes up to 6,560 feet in elevation in the southeastern part of California, including the Colorado and parts of the Mojave deserts. This habitat often develops in areas where water gathers during the rainy season—such as on dry streambeds and near the bases of mountains. Cactus scrub experiences conditions similar to desert scrub, but usually forms where water is more plentiful.

How It Got There

Cacti are part of a diverse New World family (only one species of cactus is native to the Old World!) that evolved after the southern supercontinent, Gondwanaland, split into South America and Africa. Cactus relatives believed to be the ancestors of our modern cacti can still be found in South America. Some of California's cactus species may have lived here even before the last Ice Age, but others are probably of more recent origin.

Cactus Scrub Climate

Summers in the cactus scrub are hot and dry, and winters are cool and relatively moist. Average annual precipitation, mainly from rainfall, varies between 1 and 10 inches. In addition to being scarce, rainfall is unpredictable, with some years seeing their entire annual rainfall arrive in a single storm. In the Colorado Desert cactus scrub, rain can come year-round, but snowfall and below-freezing temperatures are rare.

Temperatures in this habitat vary with elevation, and daily temperature ranges can be extreme; a daily range of 50°F between high and low temperatures is not uncommon. The greatest recorded temperature range recorded in a 24-hour period in Palm Springs was 81°F, from a low of 39°F to a high of 120°F. At Borrego Springs (at approximately 1,000 feet in elevation) in Anza-Borrego Desert State Park, the average high temperature in January is 68°F, and the average high temperature in August is 106°F. The average low temperature in January is 43°F, and the low temperature in August averages 75°F. In addition to extreme temperatures, the cactus scrub climate is influenced by cloudless, windy skies and low humidity. In springtime, sandstorms caused by high are fairly common.



Eco-Facts

Rough Scrub

With its widely ranging temperatures and minimal rain, the cactus scrub offers a harsh environment for would-be residents. The plants and animals that do make their homes here boast unique strategies for surviving the intense conditions.

Cactus Scrub Plants

Plants in this habitat:

- ❖ are able to trap and store water
- ❖ can withstand extreme ranges in daily temperature
- ❖ have extensive horizontal root systems

Key Plants

Shrubs	Succulents	desert century plant	teddy bear cholla
brittlebush	agave	(<i>Agave deserti</i>)	(<i>Opuntia bigelovii</i>)
(<i>Encelia farinosa</i>)	(<i>Agave</i> sp.)	fish-hook cactus	prickly pear
jojoba	beavertail cactus	(<i>Mammillaria</i> sp.)	(<i>Opuntia</i> sp.)
(<i>Simmondsia chinensis</i>)	(<i>Opuntia basilaris</i>)	hedgehog cactus	
ocotillo	California barrel cactus	(<i>Echinocereus engelmannii</i>)	
(<i>Fouquieria splendens</i>)	(<i>Ferocactus cylindraceus</i>)	saguaro cactus	
yucca	cottontop cactus	(<i>Carnegiea gigantea</i>)	
(<i>Yucca</i> sp.)	(<i>Echinocactus polycephalus</i>)		

What It Takes to Survive: Reservoirs, Roots, and Sharp Appendages

Most cactus scrub plants are succulents that conserve water in their stems, leaves, or roots. Despite their impressive storage capacities, you won’t find drinking water by cutting a cactus open; the stored water is suspended in gluey, bitter, and often toxic tissue. Cacti collect water via long, shallow roots that spread out for several yards below the ground, ready to absorb water from even the slightest of rains. (The roots of a two-foot tall cholla can extend as far as 30 feet.) Many cacti have spines or other mechanisms for defense. The spines, as well as sharp, barbed bristles called glochids, discourage animals from rubbing against a plant and thus minimize the damage a passerby can do.

Plant Adaptation Case Studies



saguaro (*Carnegiea gigantea*)

Camels of the Plant World

Cacti avoid dehydration by storing water in their stems. The water stored in succulent tissue allows the cacti to continue photosynthetic activity even when water is not available to their roots. The pleated or ribbed stems of some cactus species allow them to expand without stretching during water uptake.

Most leafy plants cool themselves during the day by opening their pores, but cacti only open their pores at night to reduce moisture loss. Century plants store water in leaves covered with a thick, light gray, waxy coating that keeps them from overheating. The gray leaves reflect more light and heat than the green leaves of most plants. Silvery hairs cover the leaves of the brittlebush plant, reflecting away much of the sun’s damaging heat.



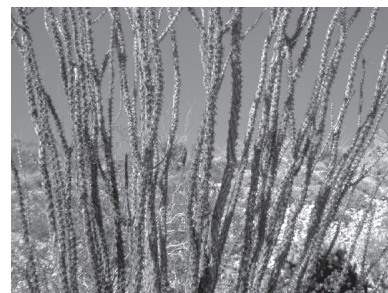
teddy bear cholla (*Opuntia bigelovii*)

Cacti Take the Heat

The densely packed spines that cover teddy bear chollas and other cacti create shade and trap air, providing insulation from intense desert heat. Prickly pear cacti tilt their flattened stems, or pads, upward, so they face the sun in early morning and late afternoon, but not during the hottest part of the day when they would burn and dry out. Similarly, the small leaves of the jojoba point directly upward to catch the cool morning sunlight but avoid the hot midday sun.

Ocotillo: Fast Bloomers

The combination of little and unpredictable rainfall and a high rate of water evaporation from plant tissue provides a challenge for desert plants. In response to these conditions plants such as ocotillos have evolved many adaptations. Ocotillos, 10- to 20-foot tall, drought-deciduous plants that remain leafless most of the year, can quickly grow new leaves. Two to three days after a winter rain ocotillos display new leaf buds; five days later the leaves mature; five weeks later they turn yellow and fall off. Ocotillo stems contain chlorophyll and photosynthesize, producing just enough sugar to allow the plants to form leaves when the necessary water becomes available. When long droughts punctuate several rainy periods, a single plant can grow and lose its leaves several times a year.



ocotillo (*Fouquieria splendens* ssp. *splendens*)



saguaro flower (*Carnegiea gigantea*)

Showy Flowers Seek Willing Pollinators

Cacti produce large, eye-catching flowers with lots of petals and pollen-carrying stamens. Flower colors range from yellow to pink and red to purple. The majority of cacti in southeastern California bloom in spring and early summer when they're pollinated by several bee species. Birds, moths, and bats pollinate other cacti. The pollen-bearing stamens of many cacti are attracted to movement and reach down to rub pollen on insects as they move across a flower's surface; the insects carry pollen to other flowers, fertilizing the cacti.

(Quarter of a) Century Plants

Despite their name, century plants, or desert agaves, bloom after 8 to 25 years, depending on the species, and then die. They spend the majority of their lives collecting the food, energy, and water they need to flower. But the flowering stalks they produce are incredible—growing almost an inch each day, stalks can reach heights of 5 to 15 feet! Century plants can also reproduce by budding new plants at the base of the parent plants.



agave (*Agave* sp.)

Cactus Scrub Animals

Animals in this habitat are:

- ✦ able to conserve water or survive without it for long periods of time
- ✦ capable of surviving extreme temperatures
- ✦ often active at night

Key Animals

Amphibians

western spadefoot toad
(*Scaphiopus hammondi*)

Birds

cactus wren
(*Campylorhynchus brunneicapillus*)
Costa's hummingbird
(*Calypte costae*)
Gambel's quail
(*Callipepla gambelii*)

greater roadrunner
(*Geococcyx californianus*)
mourning dove
(*Zenaida macroura*)

verdin
(*Auriparus flaviceps*)

Invertebrates

cochineal scale
(*Dactylopius coccus*)

Mammals

black-tailed jackrabbit
(*Lepus californicus*)
desert bighorn sheep
(*Ovis canadensis nelsoni*)
desert woodrat
(*Neotoma lepida*)
white-tailed antelope ground
squirrel
(*Ammospermophilus leucurus*)
Merriam's kangaroo rat
(*Dipodomys merriami*)

pocket mouse
(*Perognathus* sp.)

Reptiles

barefoot banded gecko
(*Coleonyx switaki*)
chuckwalla
(*Sauromalus obesus*)
desert iguana
(*Dipsosaurus dorsalis*)
desert tortoise
(*Gopherus agassizii*)

Keeping Their Cool

Animals in the cactus scrub, like the plants, must cope with drought, temperature extremes, and a limited water supply. The strategy most commonly used to survive the desert environment is avoidance; animals stay out of the sun and hide in burrows during the hottest hours of the day and hibernate or estivate when temperatures become too high or too low. Cold-blooded animals fare especially well in the desert, since they obtain their heat directly from the sun and don't need to waste metabolic energy from food to regulate body temperature. Reptiles especially can better survive on the limited food available in the cactus scrub. What food they do require goes to less energy-intensive bodily functions than temperature maintenance.

Animal Adaptation Case Studies



jackrabbit (*Lepus* sp.)

Feeling Hot, Hot, Hot!

Animals in the desert need to keep cool and conserve water. Many mammals, such as kangaroo rats and pocket mice, survive the desert's heat and dryness by avoiding these conditions. They scurry around at night, dawn, and dusk, and rest in burrows during the day. Similarly, desert woodrats spend their days hiding in tunnels below their large nests. Black-tailed jackrabbits are some of the few mammals active during the daytime; their long, thin ears radiate excessive heat from their bodies.

Readymade Reservoirs

Some animals store extra water in their bodies. The desert tortoise holds water in its bladder and the chuckwalla reserves it in its tail. Remarkably, some animals can go their entire lives without taking a sip of water. Some insect-eating bird species, such as cactus wrens, can get all the water they need from their food. Kangaroo rats possess the most efficient kidneys in the world, allowing them to produce water metabolically from the seeds they eat.



desert tortoise (*Gopherus agassizii*)



greater roadrunner (*Geococcyx californianus*)

Predators: Keep Out!

Cactus wrens, mourning doves, and greater roadrunners build nests in cholla to protect themselves from predators. Desert woodrats sometimes build their large dens out of cholla. While these structures protect the woodrats from larger predators, such as coyotes, snakes sometimes follow woodrat trails back to the nests in search of warm-blooded feasts.



Under Threat

Federal and State Listed Species

The barefoot banded gecko lives on rocky outcroppings surrounded by scrubby agave, yucca, cholla, brittlebush, and ocotillo. This California-listed threatened species spends most of its time in underground burrows where humidity is higher than surrounding areas. It only comes out at night when temperatures are lower.

The desert tortoise is a state- and federal-listed threatened species that builds its burrow in compacted sand and feeds on cactus and other plants.



Cactus Scrub and Californians

Native Connection

Desert agave was an important food for California Indian desert peoples and was harvested in early spring and late fall, when other food sources were scarce. Four- to five-foot long agave stalks and leaves were baked and flower buds and pods were cooked and stored for later use. Agave fibers were used in basket making and to make cord and rope. California barrel cactus fruits were cooked and eaten or dried in the sun and stored for later use. The pulp of one species of barrel cactus provided an emergency source of drinkable liquid, and parts of the barrel cactus were used as cooking pots when hollowed out, filled with hot rocks, and re-covered. Some tribes used barrel cactus spines to create tattoos (agave pigment was often used as a tattoo coloring).

Beavertail cactus was a staple food; the entire plant could be eaten after spines

and glochids (barbed hairs) were removed. Some tribes ate prickly pear fruits, and the Cahuilla made a drink from boiled, pounded jojoba nuts. Ocotillo flowers were also used to make a drink (after being soaked in water), and the seeds and flowers were eaten as well. California Indians sometimes used ocotillo stems in construction of walls, roofs, and fences.

Human Footprint

Like most desert habitats, the cactus scrub suffers from environmental problems caused by urban development, agriculture, mining, invasion by exotic plant species, and the consequences of recreational land use. Most significantly, the increasing popularity of off-road or off-highway vehicles has resulted in the death of desert vegetation, soil compaction (which reduces the ability of water to filter down to plant roots), increased erosion and air pollution as sand and other particulates become airborne, and decreased lizard populations.

Cochineal, a scale insect that feeds on prickly pears, is a current source of red dye in the United States; it produces one of the few reds approved for use in food by the Food and Drug Administration.

What People Are Doing

The cactus scrub habitat in Joshua Tree National Park is being restored to maintain the integrity of the habitat for threatened species like the desert tortoise. ❁



Resources

Books and Periodicals

Bowers, Janice Emily. 1993. *Shrubs and trees of the southwest deserts*. Tucson:Southwest Parks and Monuments Association.

Jaeger, Edmund C. 1965. *The California deserts*. 4th ed. Stanford: Stanford University Press.

Lindsay, Lowell, and Diane Lindsay. 1998. *The Anza-Borrego desert region*. Berkeley: Wilderness Press.

Phillips, Steven J., and Patricia Wentworth Comus, eds. 2000. *A natural history of the Sonoran Desert*. Berkeley: University of California Press.

Websites

Anza-Borrego Desert State Park

DesertUSA

<http://www.desertusa.com>

Key term: Anza Borrego

Barrel Cactus

San Diego Chapter, Sierra Club

<http://www.sierraclub.org/chapters/sandiego/rareplants/097.html>

Desert Animal Survival

DesertUSA

<http://www.desertusa.com/survive.html>

Desert Habitats

Arizona-Sonora Desert Museum

<http://desertmuseum.org/desert/>

Joshua Tree National Park

National Park Service

<http://www.nps.gov/jotr/>

Ocotillo

USDA Forest Service

<http://www.fs.fed.us/database/feis/plants/shrub/>

Key terms: ocotillo, fouquieria splendens

DesertUSA

http://www.desertusa.com/nov96/du_ocotillo.html

Sites to Visit

Cactus Garden (San Diego County)

Cactus Loop Trail (San Diego County)

Cholla Garden and Ocotillo Patch (Riverside County)